



Pre-Algebra Workbook Solutions

Exponents

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MATH

EXPONENTS

■ 1. Complete the statement.

An exponent tells you how many times to multiply the base by
_____.

Solution:

itself

■ 2. Is 2^3 the same as 3^2 ? Why or why not?

Solution:

No, it's not the same. 2^3 means $2 \cdot 2 \cdot 2 = 8$, whereas 3^2 means $3 \cdot 3 = 9$.

■ 3. Find the sum.

$$5^3 + 2^4$$

Solution:



Find the value of each term individually, then add the results.

$$125 + 16$$

$$141$$

■ 4. Write the number using exponents.

$$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$$

Solution:

Because we're multiplying nine factors of 2, we can express that as 2^9 instead.

■ 5. Find the product.

$$3^4 \cdot 3^3$$

Solution:

Find the value of each term individually, then add the results.

$$81 \cdot 27$$

$$2,187$$



- 6. Write the following number without an exponent.

$$1^6$$

Solution:

Because we're multiplying six factors of 1, we can express that as $1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1$ instead.

- 7. Write the number using exponents.

$$10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$$

Solution:

Because we're multiplying five factors of 10, we can express that as 10^5 instead.

- 8. Write the number without an exponent.

$$9^6$$



Solution:

Because we're multiplying six factors of 9, we can express that as $9 \cdot 9 \cdot 9 \cdot 9 \cdot 9 \cdot 9$ instead.



RULES OF EXPONENTS

- 1. Find the sum.

$$2x^3 + x^3 + x^3 + 3x^3$$

Solution:

Because all these terms are x^3 terms, we're able to add them.

$$(2 + 1 + 1 + 3)x^3$$

$$7x^3$$

- 2. Find the product.

$$x^6 \cdot x^2 \cdot x^3$$

Solution:

When we multiply terms with like bases, we add the exponents.

$$x^{6+2+3}$$

$$x^{11}$$



■ 3. Simplify the expression.

$$x \cdot x \cdot x$$

Solution:

When we multiply terms with like bases, we add the exponents.

$$x^{1+1+1}$$

$$x^3$$

■ 4. Stephanie and Jimmy are trying to find a shortcut to simplify the expression below. Stephanie says that they should add the exponents ($3 + 5 = 8$) and then raise 4 to that power. Jimmy says that since it's multiplication, they should multiply the exponents ($3 \cdot 5 = 15$) and then raise 4 to that power. Who is correct and why?

$$4^3 \cdot 4^5$$

Solution:

Stephanie is correct. 4^3 is equivalent to $4 \cdot 4 \cdot 4$, and 4^5 is equivalent to $4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$. If we're multiplying these values together, we get

$$4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4$$



$$4^8$$

65,536



POWER RULE FOR EXPONENTS

■ 1. Complete the statement.

The power rule tells us that, when you raise a power to a power, you can _____ those powers together.

Solution:

multiply

■ 2. Simplify the expression.

$$(x^3)^3$$

Solution:

Applying the power rule for exponents, we multiply the exponents.

$$x^{3 \cdot 3}$$

$$x^9$$

■ 3. Simplify the expression.



$$(x^2)^{-4}$$

Solution:

Applying the power rule for exponents, we multiply the exponents.

$$x^{2(-4)}$$

$$x^{-8}$$

■ 4. Simplify the expression.

$$(2^m)^p$$

Solution:

Applying the power rule for exponents, we multiply the exponents.

$$2^{(m \cdot p)}$$

$$2^{mp}$$



QUOTIENT RULE FOR EXPONENTS

- 1. Simplify the expression.

$$\frac{x^5}{x^6}$$

Solution:

Use quotient rule to simplify across the numerator and denominator.

$$x^{5-6}$$

$$x^{-1}$$

- 2. Simplify the expression.

$$\frac{x^{2a}}{x^2}$$

Solution:

Use quotient rule to simplify across the numerator and denominator.

$$x^{2a-2}$$



■ 3. Simplify the expression.

$$\frac{(x^{2p})^3}{x^{3p}}$$

Solution:

Use power rule to simplify the exponent in the numerator.

$$\frac{x^{6p}}{x^{3p}}$$

Now use quotient rule to simplify across the numerator and denominator.

$$x^{6p-3p}$$

$$x^{3p}$$

■ 4. Simplify the expression.

$$\frac{(x^{3a+4})^2}{x^{4a}}$$

Solution:

Use power rule to simplify the exponent in the numerator.

$$\frac{x^{2(3a+4)}}{x^{4a}}$$



$$\frac{x^{6a+8}}{x^{4a}}$$

Now use quotient rule to simplify across the numerator and denominator.

$$x^{6a+8-4a}$$

$$x^{2a+8}$$



